

Clemson IPM Program Newsletter

April 2022

Issue #7

Integrated pest management is an ecologically-based approach to managing pests with an emphasis on using multiple management strategies. The principles of IPM can be applied to any pest of food or fiber production systems, landscapes, and urban environments. IPM considers multiple control tactics with the aim of minimizing selection pressure on one given tactic.

The Clemson IPM program (<https://www.clemson.edu/extension/ipm/index.html>) seeks to increase adoption of IPM practices in South Carolina by developing interdisciplinary, research based information, and providing it to the public in efficient and accessible formats. The goals of the IPM program are driven by the needs of stakeholders, who have an integral part in developing the priorities of the current program.

The Clemson IPM Newsletter will provide updates on research, extension programs, successes in IPM, important dates, and more!



@IPM_Clemson

Follow the Clemson IPM program on Twitter for real time updates throughout the growing season

Meet the Team

Pee Dee REC

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JC Chong, *Specialty Crop Entomology*

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Ben Powell, *Pollinator Specialist*

Coastal REC

Tony Keinath, *Vegetable Pathology*

Matt Cutulle, *Vegetable Weeds*

Brian Ward, *Organic Vegetable*

The IPM program at Clemson is comprised of the coordination team, extension personnel, and researchers throughout the state.

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Tell us what you think...

Please take a few minutes to fill out this [survey](#) to tell us what you would like to see in future editions of this newsletter!

Partial support for the Clemson IPM Program is provided by funding from the USDA NIFA Crop Protection and Pest Management Extension Implementation Program.

A New Strategy For Managing Cucurbit Downy Mildew and Reduced Fungicide Efficacy

Two recent studies on cucurbit downy mildew identify planting date as an important factor for reducing yield loss and illustrate reduced sensitivity to group 49 fungicides.

Contributing author: Dr. Tony Keinath

In South Carolina, one of the most common diseases that infects and damages both slicing and pickling cucumbers is downy mildew. Downy mildew affects the leaves as chlorotic and necrotic spots on the upper surface, ultimately leading to a reduction in photosynthesis which can interfere with the development of cucumbers. Downy mildew does not successfully overwinter in South Carolina but is spread from more southern states via wind-blown spores each year. It can travel up to 600 miles in two days allowing it to spread readily. Effective management of this common disease relies on integrated management through all available strategies including fungicides and cultural control strategies.

At the Coastal Research and Education Center in Charleston, SC, Dr. Tony Keinath, a vegetable pathologist, and Dr. Felipe Silva, an agricultural economist, conducted a study in 2021 demonstrating the value of planting early for managing cucurbit downy mildew. “Downy mildew is the number one disease of cucumber in South Carolina” Dr. Keinath said, emphasizing the importance of continued work on identifying and improving integrated control strategies.

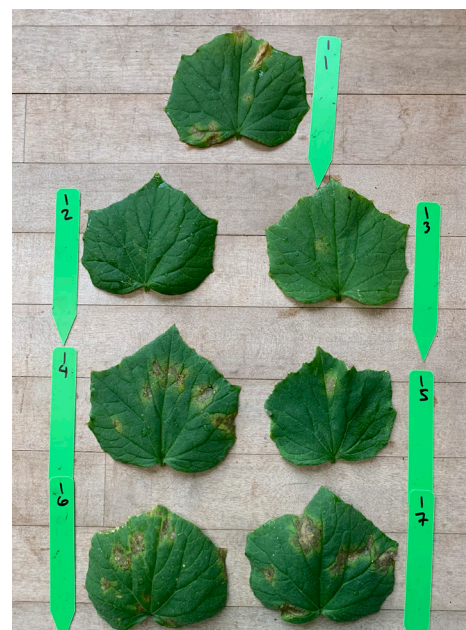
In this study investigating planting

date, 10 plots of three rows each were planted on March 24, representing an early planting date, and May 10, representing a planting date late in the traditional planting window. Half of the plots for each planting date were sprayed with fungicides. Disease severity was then monitored, and the cucumber yield was assessed at harvest.

This study illustrated the importance of planting early for growers to avoid warm, wet weather that favors downy mildew development. The early planting allows cucumbers to produce fruit and be harvested prior to the disease developing to the point of limiting yield. In this study, the early planted sprayed cucumber yielded 1,603 cartons per acre compared to just 930 cartons per acre in the late planted sprayed cucumber. “Our study found that 43% of the crop was lost to the disease for cucumbers planted late, as compared with no loss for cucumbers that were planted early”, Dr. Keinath said. The difference between the early and late planting dates was even greater for the nonsprayed cucumbers. The early planting yielded 1,648 cartons per acre, while the late planting yielded only 206 cartons per acre, an 87% yield reduction. “By planting early, growers can produce cucumbers in South Carolina without spraying



Cucurbit downy mildew symptoms on cucumber leaf treated with 0.25x rate of Orandis



Downy mildew symptoms on leaves treated with varying rates of Orandis. Leaves labeled 1 and 7 are non-sprayed. Leaves 2-6 treated with 0.13x through 1x the field rate

fungicides most years,” Keinath recommended. The [cucurbit downy mildew forecasting program](#) can be used online to assess the risk of downy mildew based on planting date in your area.

Fungicides are another important tool for managing downy mildew. Due to the extensive...(cont.page 3)



Left; Early planted cucumber plots treated with a rotation of Bravo and Presidio fungicides, photographed during the early harvest. Right; Symptoms of downy mildew on cucumber. Note the angular chlorotic spots on the upper surface of the leaf

use of fungicides and the rapid generation time of pathogens, fungicide resistance is common in downy mildew. Another recent study conducted by Dr. Keinath identified reduced sensitivity of downy mildew to oxathiapiprolin fungicides in South Carolina. Oxathiapiprolin has been the most effective material to manage cucurbit downy mildew since its introduction in 2015 and was used on 41% of the total cucumber crop in 2020. Oxathiapiprolin is classified in FRAC group 49 with a single-site target, making it a medium to high-risk material for fungicide resistance. In the United States, it is available only as a pre-mixed formulation with chlorothalonil (Orondis Opti) and manipropamid (Orondis Ultra). Despite its high level of efficacy in the past, field experiments conducted in South Carolina and Georgia in 2020 found that oxathiapiprolin was no longer the most effective fungicide amongst a number of commonly applied materials.

Based on this initial field study, Dr. Keinath conducted three bioassays in 2020 and 2021 to assess the sensitivity of two strains of downy

mildew to oxathiapiprolin, compared to previously reported sensitivities. This study consisted of four to five rates of oxathiapiprolin applied to potted cucumber, butternut squash, and watermelon at 0.13x, 0.25x, 0.5x, 1x, and 2x the maximum field rate. After fungicide applications the plants were moved to the field to be exposed to downy mildew naturally for two days then moved back to the greenhouse, where the disease severity was assessed at five and seven days later.

The disease severity decreased as the rate of fungicide increased as expected, but disease severity was increased compared to bioassays conducted in another study in 2015. The current EC₅₀ values (i.e. concentration required to inhibit fungal growth by 50%) from Dr. Keinath's study represent a significant increase from the 2015 study. It appears the cucumber strain of downy mildew is becoming less sensitive to oxathiapiprolin. For more information on Dr. Keinath's fungicide resistance study, read the [full publication](#) in Plant Health Progress.

To slow the resistance of downy

mildew to oxathiapiprolin, growers should increase the number of sprays of other materials in their rotation. An efficacious fungicide rotation with respect for resistance management, as well as cultural controls such as an early planting date as described above, are two components of an integrated pest management plan for downy mildew in cucumber. Additional information on cucurbit downy mildew can be found in this [Land-Grant Press article](#).

Aphid Management in Greenhouse Ornamental Production

A new insecticide mode of action provides a valuable new tool for integrated management of an important greenhouse pest of ornamental plants.

Contributing Author: Dr. JC Chong



Left: roses treated with varying rates of chordotonal organ modulating insecticides. Right; potato aphid infestation on the terminal of a rose plant

There are over 1300 species of aphids in North America; many are pest species. Aphids are small insects that feed by tapping into the phloem tissues and suck up sap using a straw-like mouth. Different species can vary widely in color, but generally they have pear-shaped bodies and a pair of tube-like structures (called cornicles) on the hind end of the body. Aphids can reproduce asexually and give birth to live offspring, allowing populations to grow rapidly under ideal conditions. A single generation can take as little as seven days to complete in some cases. When colonies become too crowded, winged female aphids are produced to fly away from the original hosts and establish new colonies on new host plants.

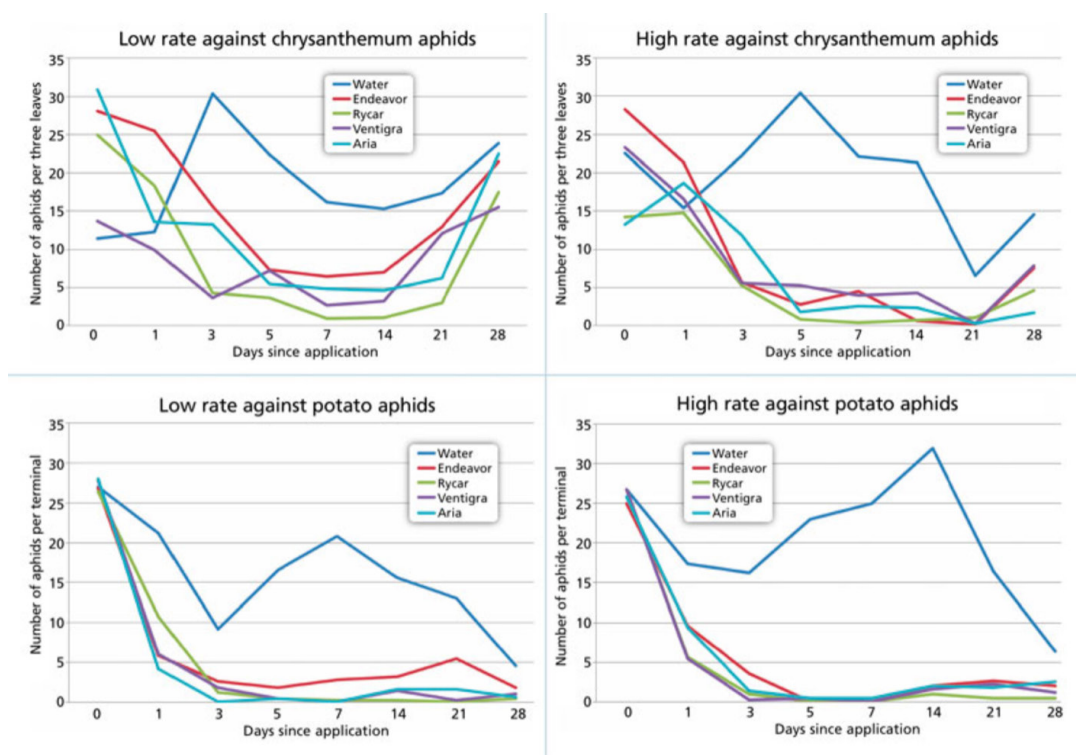
Severe aphid infestation can lead to yellowing leaves and stunted shoots. Aphids also excrete honeydew, a sticky substance created by

the leftover sugary sap excreted by the aphids. Honeydew landed onto to plant surfaces can create sticky, shiny spots and allow for the growth of black sooty mold which can reduce the photosynthesis and growth of the infested plants. Some aphid species can also vector plant viruses, which can cause more concern than the direct damage.

Several aphid species are major pests of ornamental crops in greenhouses. Aphids are fairly easy to manage through insecticides and biological control. Neonicotinoids are highly water-soluble insecticides that are highly effective against aphids when applied as foliar spray or media drench. Drench application of systemic insecticides, such as neonicotinoids, can help preserve biological control agents, because the insecticide will be ingested by the aphids when they suck on the sap but will not be in contact with the biological con-

trol agents. However, the presence of neonicotinoid residue in pollen and nectar poses risks to pollinators. As a result, many growers have decided not to use neonicotinoids for managing sap-sucking insects; this change in pest management approach has driven researchers to look for alternatives.

Dr. JC Chong, an ornamental entomologist at Pee Dee Research and Education Center (PDREC), recently studied the efficacy of a newer class of insecticides known as the chordotonal organ modulators. An insect's chordotonal organs are responsible for detecting a variety of mechanical stimuli and give the insect information on its position relative to the its environment. Disruption of the normal function of the chordotonal organs disable an insect's ability to perceive its environments and its own movements. This type of poisoning can cause... (cont. page 5)



Efficacy of group 9 and 29 insecticides at low and high rates against potato and chrysanthemum aphids. Figure from Dr. JC Chong's [article](#).

disorientation and an insect's inability to hold onto host plants, fly, or feed effectively.

Four chondrotomal organ modulator insecticides are registered for aphid management on greenhouse ornamentals—Endeavor (pymetrozine), Rycar (pyrifluquinazon), Ventigra (afidopyropen), and Aria (flonicamid). Dr. Chong's study aimed to determine which of these insecticides were most effective and longest lasting against the potato aphid on roses and the chrysanthemum aphid on garden mums. Dr. Chong also compared the effectiveness of a low and a high rate of each insecticide. The aphid-infested plants were sprayed once, and the number of aphids was then counted over 28 days.

All tested insecticides, at both high and low rates, reduced potato aphid population in just one day after application; the aphids were eliminated almost completely by

the fifth day. Plants sprayed with the low rate of Endeavor still had some aphids but the number was much lower than what was on plants sprayed only with water. The chrysanthemum aphid population took three days to reduce, suggesting that there was a difference in the effectiveness of the tested insecticides against different aphid species. Chrysanthemum aphid population also recovered faster with the population on plants treated with the low rate of the insecticides growing again by Day 28 of the experiment.

Dr. Chong also tested how long one application of each insecticide at each rate might last under greenhouse condition. To test the residual activity of each insecticide, leaves were collected from each treatment at one, three, five, seven, 14, 21, and 28 days after application. Ten healthy aphids were then introduced to each leaf and assessed for mortality or population

growth after six days.

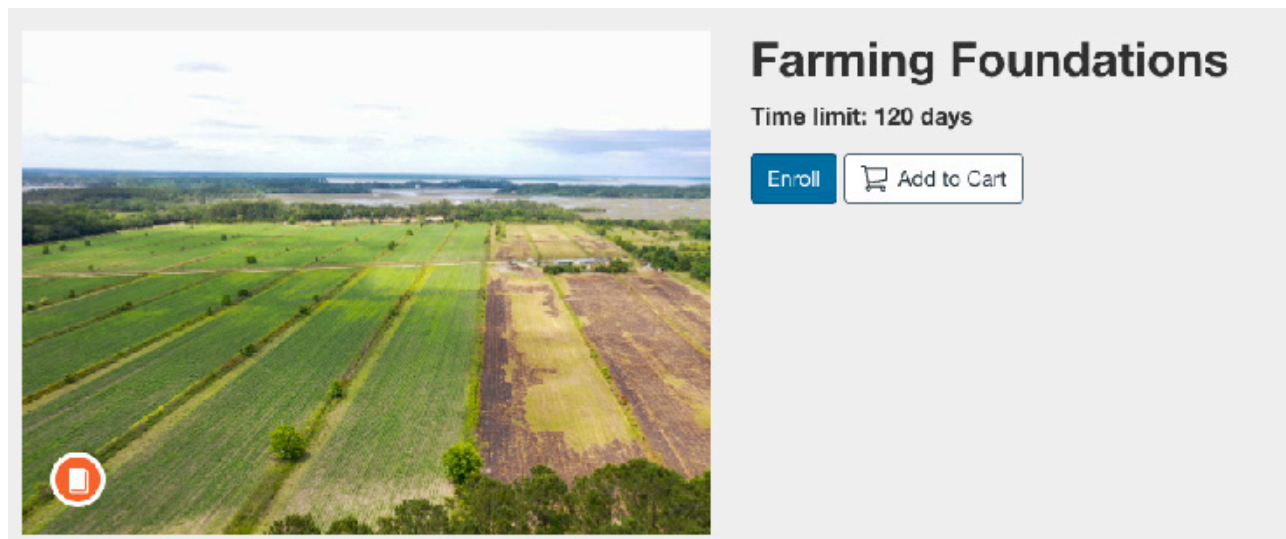
One application of Endeavor and Aria at both rates lasted 14 days, and Ventigra at both rates lasted 28 days against potato aphids. For Rycar, residual activity of the low rate broke at 14 days and the high rate at 28 days. For chrysanthemum aphid, residual breaks were observed at 14 days at the low rate and 21 days at the high rate of Endeavor. Breaks were at 14 days for both rates of Rycar, and 21 days for both rates of Ventigra and Aria.

Results from Dr. Chong's study will help greenhouse ornamental plant growers to better time the reapplication timing of Aria, Endeavor, Rycar and Ventigra when using these insecticides for aphid management. For more information on managing aphids on ornamental crops and additional details on the studies discussed here, visit this [article](#) from Dr. Chong.

Clemson Extensions' Farming Foundation Program Launches

The online farming foundations program launched in 2022 provides growers with critical information to avoid common pitfalls when beginning farming.

Contributing author: **Zack Snipes**



Enrollment page for the farming foundations program found [here](#)

Clemson Extension has recently launched an online program to help South Carolina residents new to farming. Farming Foundations is a free online program consisting of 14 modules, that covers basic and advanced topics that will help growers develop a strategy for a successful operation.

Zack Snipes, the assistant program leader for the Clemson Cooperative Extension Service horticulture team and area extension agent, was instrumental in developing the program and getting it launched with fellow extension agents Justin Ballew, Bruce McClean, Rob Last, Kerrie Roach, Andy Rollins, Phillip Carnley, and the CU Online Team. “This course was designed for new or beginning farmers who are looking to hobby farm or start their own commercial farm,” Snipes said. “Agents get many questions from

prospective farmers. There is a ton of information to learn when starting out, so this class is structured to give participants a good foundation before they start.”

Beginning growers can often fall into common pitfalls that can be very costly. The risk is mitigated by improving grower knowledge which will help them steer clear of these common mistakes. Topics covered in the program include soils, fertility, field preparation, irrigation, farm safety, small tools and tractors, extension agent assistance, and more. Growers enrolled in the course are also tasked with implementing strategies in their field, such as taking soil samples or making a farm tool checklist. Some of these activities also provide a good foundation for farm record keeping, an essential long-term farming success strategy.

Growers can enroll in the farming foundations program anytime, but it must be completed within 120 days once started. After completing the course, participants will have a strong base level of knowledge to avoid common pitfalls and continue to grow and succeed.

For more information, contact your [local extension office](#) or to register for the course visit the farming foundations [webpage](#).